



PERMIT APPLICATION REVIEW SUMMARY

New Hampshire Department of Environmental Services
Air Resources Division
P.O. Box 95, 29 Hazen Drive
Concord, NH 03302-0095
Phone: 603-271-1370 Fax: 603-271-7053

Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 1 of 16

PROJECT DESCRIPTION

Public Service of New Hampshire - Merrimack Station has filed a Temporary Permit application requesting to install a wet, limestone-based flue gas desulphurization (FGD) system to control mercury emissions from Electric Generating Units MK1 and MK2, as required by RSA 125-O:11. The FGD system will also provide a co-benefit by removing sulfur dioxide emissions. The application was filed in accordance with RSA 125-O:13, I, which requires this Facility to file an initial permit application by June 8, 2007. The permit establishes limits on mercury and sulfur dioxide emissions based on the requirements of RSA 125-O:13 and 40 CFR 51.308, respectively. The permit also contains applicable monitoring, performance testing, recordkeeping and reporting requirements for the purpose of ensuring that the Facility can comply with the requirements of RSA 125-O:13 and 40 CFR 51.308.

As part of this project, PSNH - Merrimack Station has proposed the installation of a limestone unloading and processing system. Limestone will be received by railcar and conveyed to a storage silo. The limestone will be conveyed from the storage silo to a wet ball mill to crush the limestone to the appropriate size and create limestone slurry that will serve as the reagent in the FGD system. The conveyor systems will be enclosed where practical and the ball mill will be enclosed inside a building so as to minimize the potential for limestone dust emissions.

Once the FGD system is constructed and operational, initial stack testing for mercury and certified continuous emissions monitoring system (CEMS) data for sulfur dioxide emissions on MK1 and MK2 will be used to (1) determine whether the Facility complies with the applicable mercury and sulfur dioxide limits contained in the temporary permit; and (2) to establish any necessary operating parameters to ensure that the mercury and sulfur dioxide limits will be met on an ongoing basis. Periodic stack testing and/or continuous emission monitors will be used to verify that the parameters used to monitor and control mercury and sulfur dioxide emissions continue to be valid.

The Facility currently operates under the application shield provisions of Env-A 609.08, *Application Shield* and in accordance with permits FP-T-0054 (MK1), TP-B-0462 (MK2), PO-B-0034 (CT1), PO-B-0035 (CT2), PO-B-1788 (Emergency Generator), TP-B-0490 (Emergency Boiler), PO-B-2416 (Primary Coal Crusher) and PO-B-2417 (Secondary Coal Crusher), which are currently in the process of being streamlined into a Title V Operating Permit. These previously issued permits will be referenced as "Previous Permits" throughout this document. The Temporary Permit includes new conditions associated with this project, and where necessary, identifies conditions of the Previous Permits that will either be modified or superseded as a result of this project. All terms and conditions of the Previous Permits not specifically identified in this permit remain in effect and unchanged. Upon issuance of this permit, the Owner shall comply with all unchanged terms and conditions of the Previous Permits and all terms and conditions of the Temporary Permit.

FACILITY DESCRIPTION/PERMIT HISTORY

Public Service of New Hampshire - Merrimack Station is a fossil fuel-fired electricity generating Facility, owned and operated by Public Service of New Hampshire (PSNH), a subsidiary of Northeast Utilities. The Facility is comprised of two utility boilers, two combustion turbines operating as load shaving units, an emergency generator, an emergency boiler, and coal handling systems including primary and secondary coal crushers, coal piles, coal conveyor systems, and coal unloading from railcars. The Facility operations also include various activities that are classified as insignificant or exempt activities.

The two utility boilers (MK1 and MK2) primarily burn bituminous coal; the two combustion turbines primarily burn No. 1 fuel oil or JP-4; the emergency generator burns No. 2 fuel oil or diesel fuel, and the emergency boiler burns No. 2 fuel oil or diesel fuel. PSNH - Merrimack Station ignites the utility boilers with No. 2 fuel oil.

Each boiler stack is equipped with continuous emissions monitoring systems (CEMS) for NO_x, SO₂, and CO₂ and a continuous opacity monitoring system (COMS). PSNH - Merrimack Station has installed control equipment and

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 2 of 16

implemented operational changes to reduce emissions, including trials of low sulfur coals to control sulfur dioxide (SO₂) emissions, selective catalytic reduction (SCR) systems to control nitrogen oxide (NO_x) emissions, and electrostatic precipitators (ESP) to control particulate matter (PM) emissions. PSNH has also initiated mercury reduction trials including carbon injection and the use of low mercury coals.

PSNH – Merrimack Station operates a fly ash re-injection system in each of the two Boilers. PSNH - Merrimack Station receives bituminous coal by railcar and by trucks. The coal conveyor systems are enclosed, where practical, and coal crushing occurs inside a building.

The Facility currently holds air permits for the following existing devices:

Table 1 – Existing Permitted Devices at PSNH Merrimack Station

EU	Device	Permit Number	Permit Issued	Permit Expires	Status
MK1	Utility Boiler #1	FP-T-0054	6/8/00	12/31/02	Operating under Application Shield provisions of Env-A 609.08
MK2	Utility Boiler #2	TP-B-0462	8/23/99	1/31/02	Operating under Application Shield provisions of Env-A 609.08
MKCT1	Combustion Turbine #1	PO-B-0034	9/30/98	9/30/03	Operating under Application Shield provisions of Env-A 609.08
MKCT2	Combustion Turbine #2	PO-B-0034	9/30/98	9/30/03	Operating under Application Shield provisions of Env-A 609.08
MKPCC	Primary Coal Crusher	PO-BP-2416	7/15/98	7/31/03	Operating under Application Shield provisions of Env-A 609.08
MKSCC	Secondary Coal Crusher	PO-BP-2417	7/15/98	7/31/03	Operating under Application Shield provisions of Env-A 609.08
MKEG	Emergency Generator	PO-B-1788	7/15/98	7/31/03	Operating under Application Shield provisions of Env-A 609.08
MKEB	Emergency Boiler	TP-B-0490	3/6/03	9/30/04	Operating under Application Shield provisions of Env-A 609.08

EXISTING POLLUTION CONTROL EQUIPMENT

Table 2 – Existing Pollution Control Equipment/Method Identification

Pollution Control Equipment Number	Description of Equipment/Method	Emission Unit Number
MK1-PC1	Electrostatic Precipitator (ESP) #1 on MK1 (included with original boiler installation in 1960)	MK1
MK1-PC2	ESP #2 on MK1 installed in 1989	MK1
MK1-PC3	Selective Catalytic Reduction (SCR) deNO _x System (Operational in 1999, replacing the SNCR installed in 1995)	MK1
MK2-PC4	ESP #1 on MK2 (Included with the original boiler installation in 1968)	MK2
MK2-PC5	ESP #2 on MK2 installed in 1999	MK2
MK2-PC6	SCR deNO _x System installed in 1995	MK2

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station		Engineer:	G. Milbury		
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 3 of 16

PROPOSED PROJECT

PSNH Merrimack Station has proposed to install a limestone-based flue gas desulphurization (FGD) system to control mercury emissions with a co-benefit of reducing sulfur dioxide emissions from Electric Generating Units MK1 and MK2. The following table identifies the affected significant activities associated with this proposed project:

Table 3 – Significant Activity Identification for Proposed Project

Emission Unit Number	Description of Emission Unit	Maximum Gross Heat Input Rating	Maximum Operating Conditions
MK1 (Existing Unit)	Steam Generating Unit 1 (Installed in 1960) Front wall firing	Bituminous Coal: 1,238 MMBtu/hr	a. Maximum fuel consumption rate of bituminous coal shall be limited to 48.5 tons/hr, not to exceed 425,289 tons during any consecutive 12 month period ¹ . b. No. 2 fuel oil consumption shall be limited to 1,656 gallons per hour, not exceed 14.5 million gallons during any consecutive 12 month period ² .
MK2 (Existing Unit)	Steam Generating Unit 2 (Installed in 1968) Opposed wall firing	Bituminous Coal: 3,473 MMBtu/hr	a. Maximum fuel consumption rate of bituminous coal shall be limited to 136.2 tons/hr, not to exceed 1,193,078 tons during any consecutive 12 month period ³ . b. No. 2 fuel oil consumption shall be limited to 1,656 gallons per hour, not exceed 14.5 million gallons during any consecutive 12 month period ⁴ .
MKLC1 (Proposed Project)	Limestone Processing and Handling System	Not Applicable	Limestone processing rate of the wet limestone ball mills of less than 25 tons per hour ⁵ .

PSNH has proposed to install the pollution control equipment listed in the table below:

Table 4 – Proposed Pollution Control Equipment/Method Identification

Pollution Control Equipment Number	Description of Equipment/Method	Emission Unit Number Controlled
MK2-PC7	Flue Gas Desulphurization (FGD) System	MK1 and MK2

As part of this project, PSNH Merrimack Station will be constructing a new emissions stack associated with the FGD system. For operational flexibility, PSNH will maintain MK2 stack as a bypass stack for MK1. The following table contains the proposed stack configurations for this project.

¹ The heating value of bituminous coal is assumed to be 12,750 Btu/lb. The fuel consumption limits may vary based on the actual heat content of the fuel burned.

² No. 2 fuel oil is used to ignite individual fires before establishing the main coal fires. The heating value of No. 2 fuel oil is assumed to be 140,000 Btu/gal. The fuel consumption limits may vary based on the actual heat content of the fuel burned.

³ The heating value of bituminous coal is assumed to be 12,750 Btu/lb. The fuel consumption limits may vary based on the actual heat content of the fuel burned.

⁴ No. 2 fuel oil is used to ignite individual fires before establishing the main coal fires. The heating value of No. 2 fuel oil is assumed to be 140,000 Btu/gal. The fuel consumption limits may vary based on the actual heat content of the fuel burned.

⁵ PSNH has proposed to install 2 wet limestone ball mills. Only one mill will be operated at a time and one will serve as a backup unit.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 4 of 16

Table 5 – Proposed Stack Criteria

Stack Number	Emission Unit Number	Emission Unit Description	Minimum Stack Height (Feet) Above Ground Level	Maximum Inside Stack Diameter (Feet)
STMK2 (Bypass Stack)	MK1	Steam Generating Unit No. 1	317	14.5
STMK3 (Proposed Stack)	MK1 and/or MK2 with MK2-PC7	Steam Generating Units No. 1 and/or No. 2 with FGD system	445	21.2

PSNH has proposed the following five operational scenarios:

1. MK1 and MK2 exhausting through STMK3
2. MK1 exhausting through STMK3; MK2 not operating
3. MK1 exhausting through STMK2; MK2 not operating
4. MK2 exhausting through STMK3; MK1 not operating
5. MK1 exhausting through STMK2 stack and MK2 exhausting through STMK3

The proposed normal operating scenario will be for MK1 and MK2 to be firing coal at 100% load and exhausting through STMK3. The Temporary Permit also contains conditions that limit the amount of time MK1 can operate through STMK2 in bypass mode. Items 9 and 10 of Table 4 of the Temporary Permit require MK1 to operate through MK2-PC7 when the FGD is capable of stable operation, limits MK1 operating through STMK2 to less than 840 hours per year and requires MK1 to achieve at least a 90 percent reduction in SO₂ emissions when operating through the FGD system.

EMISSIONS

Table 6 - Total Facility Emissions Data

	PM/PM ₁₀	SO ₂	NO _x	CO	VOCs
Potential (lb/hr) ⁶	1,150.14	25,885.80	3,012.92	126.38	31.30
Potential (TPY)	5,042.90	113,249.00	10,746.5 ⁷	638.79	161.51
2006 Actual (lb/hr) ⁸	165.6	8,778.89	1,456.10	84.52	18.94
2006 Actual (TPY)	611.32	32,726.63	4963.95	314.37	69.13
2007 Actual (lb/hr) ⁹	168.42	9,481.53	1,193.57	84.28	18.95
2007 Actual (TPY)	675.42	36,485.49	3,223.86	321.57	70.75

MODELING

TRC on behalf of PSNH – Merrimack Station submitted an air dispersion modeling protocol (*Air Quality Modeling Protocol Merrimack Generating Station Bow, New Hampshire* dated February 2008) for review and comments by DES. Comments on the protocol were provided by DES. TRC, on behalf of PSNH – Merrimack Station, submitted a complete air

⁶ Potential emissions calculated using maximum operational and emissions limitations contained in previously issued permits listed in Table 1.

⁷ NO_x potential is calculated based the NO_x RACT limit of 29.1 tons per day of NO_x emissions for MK1 & MK2 combined, and the NO_x RACT limit of 50 tons per year for each of the combustion turbines and the 25 tons per year NO_x emissions limit for the emergency boiler.

⁸ Actual emissions calculated using emissions and hours of operation contained in annual emissions reports.

⁹ Actual emissions calculated using emissions and hours of operation contained in annual emissions reports as presented in the permit application.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station	Engineer:	G. Milbury
Location:	Bow, NH		
AFS #:	3301300026	Application #:	FY07-0103
		Date:	03/06/2009
			Page 5 of 16

dispersion modeling analysis for DES review and approval. All specific information related to the modeling analysis is contained in the document titled *Air Quality Modeling Report Merrimack Station Bow, NH* dated November 2008. DES has reviewed and approved the modeling report and a modeling review summary memo is attached at the end of this document for further details.

EMISSION TESTING

Initial Compliance Demonstration Requirements

PSNH - Merrimack Station shall demonstrate initial compliance with the mercury and SO₂ emission limitations specified in Table 4 of the Temporary Permit for the parameters contained in Table 5 of the Temporary Permit, within 60 days after achieving stable FGD operation with both MK1 and MK2 exhausting through stack STMK3. The initial compliance demonstration requirements are listed in Table 7 below.

Table 7 – Initial Compliance Demonstration Requirements

Applicable Emission Unit	Parameter	Method of Compliance
MK1 & MK2	Performance tests for mercury	<ul style="list-style-type: none"> a. The Owner shall conduct initial performance tests for mercury to demonstrate compliance with the respective mercury emissions limitation in Table 4, Item 13 of the Temporary Permit. b. Testing shall be conducted and the results reported in accordance with 40 CFR 60, Sections 60.8(a), (b), (d), (e), and (f), and Appendix A. The following test methods or Division approved alternatives shall be used for the pollutants specified: <ul style="list-style-type: none"> i. Method 1 or 2 to determine exit velocity of stack gases; ii. Method 3 or 3A to determine carbon dioxide, oxygen, excess air, and molecular weight (dry basis) of stack gases; iii. Method 4 to determine moisture content (volume fraction of water vapor) of stack gases; and iv. For mercury, in accordance with the mercury monitoring requirement of RSA 125-O:15 and Table 6, Item 3 of the Temporary Permit.
MK1 & MK2	Performance Test for SO ₂	<ul style="list-style-type: none"> a. The Owner shall conduct an initial performance test for SO₂ to demonstrate compliance with the respective SO₂ emissions limitation in Table 4, Items 6 and 8 of the Temporary Permit. b. Testing shall be conducted and the results reported in accordance with 40 CFR 60, Sections 60.8(a), (b), (d), (e), and (f), and Appendix A. The following test methods or DES approved alternatives shall be used for the pollutants specified: <ul style="list-style-type: none"> i. Use of certified CEMS monitors. With the use of CEMS monitors, compliance will be determined based on a monthly average of CEMS data.
MK1 & MK2	General Stack Testing Requirements	<p>Compliance testing shall be planned and carried out in accordance with the following schedule:</p> <ul style="list-style-type: none"> a. At the request of DES, submit to DES a pretest protocol at least 30 days prior to the commencement of testing which includes the following information: <ul style="list-style-type: none"> i. Calibration methods and sample data sheets; ii. Descriptions of the test methods to be used; iii. Pre-test preparation procedures; iv. Sample collection and analysis procedures; v. Process data to be collected; and vi. Complete test program description.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station	Engineer:	G. Milbury
Location:	Bow, NH		
AFS #:	3301300026	Application #:	FY07-0103
		Date:	03/06/2009
			Page 6 of 16

Table 7 – Initial Compliance Demonstration Requirements

Applicable Emission Unit	Parameter	Method of Compliance
		b. At the request of DES, participate in a pretest conference with a DES representative at least 15 days prior to the test date. c. Emission testing shall be carried out under the observation of a DES representative. d. Within 60 days after completion of testing or within 15 days of receipt of test report, submit a copy of the test report to DES.
MK1 & MK2	General Stack Testing Requirements	<i>Operating Conditions During a Stack Emissions Test</i> A compliance test shall be conducted under one of the following operating conditions: a. Between 90 and 100 % of maximum operating capacity; b. A production rate at which maximum emissions occur; or c. At such operating conditions agreed upon during a pre-test meeting conducted pursuant to Env-A 802.05.

Monitoring/Testing Requirements

PSNH - Merrimack Station is subject to the following monitoring/testing requirements for this proposed project. PSNH - Merrimack Station is subject to additional monitoring and testing requirements as specified in previously issued permits for the existing devices at the Facility. All monitoring and testing requirements will be incorporated into the Facility's Title V Operating Permit.

Table 8 – Monitoring and Testing Requirements

Device	Parameter	Method of Compliance	Frequency of Method
MK1 & MK2	Continuous Emissions Monitoring Systems	<i>Site-Specific Monitoring Plan - Continuous Emissions Monitoring Systems</i> a. The Owner shall submit a CEMS monitoring plan describing the proposed systems. The monitoring plan shall contain the information required under Env-A 808.04(c) and address all applicable monitoring requirements of Env-A 808, 40 CFR Part 60, and 40 CFR Part 75. b. The CEMS monitoring plan in item a above, shall at a minimum, address the following operating scenarios: i. CEMS monitoring for units MK1 and MK2 when both units MK1 and MK2 are operating and emissions are discharged through the common exhaust stack STMK3; ii. CEMS monitoring for compliance with the SO ₂ limitation specified in Table 4, Item 6 of the Temporary Permit; iii. Monitoring for unit MK1 when emissions are discharged through stack STMK2 (bypass stack).	At least 90 days prior to the installation of the CEM system
MK1 & MK2	Continuous Emissions Monitoring Systems	<i>Quality Assurance/Quality Control Plan Requirements</i> The Owner of a source required by this part to install, operate, and maintain an opacity or gaseous CEMS shall: a. Prepare a quality assurance/quality control (QA/QC) plan, which shall contain written procedures for implementation of its QA/QC	As specified within regulation

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station	Engineer:	G. Milbury
Location:	Bow, NH		
AFS #:	3301300026	Application #:	FY07-0103
		Date:	03/06/2009
			Page 7 of 16

Table 8 – Monitoring and Testing Requirements

Device	<u>Parameter</u>	Method of Compliance	Frequency of Method
		<p>program for each CEMS;</p> <p>b. File the QA/QC plan with the division no later than the time specified in Env-A 808.05(e) after the initial startup of each CEMS;</p> <p>c. Review the QA/QC plan and all data generated by its implementation at least once each year;</p> <p>d. Revise or update the QA/QC plan, as necessary, based on the results of the annual review, by:</p> <p>i. Documenting any changes made to the CEMS or changes to any information provided in the monitoring plan;</p> <p>ii. Including a schedule of, and describing, all maintenance activities that are required by the CEMS manufacturer or that might have an effect on the operation of the system;</p> <p>iii. Describing how the audits and testing required by this part will be performed; and</p> <p>iv. Including examples of the reports that will be used to document the audits and tests required by this part;</p> <p>e. Make the revised QA/QC plan available for review by DES at any time; and</p> <p>f. Within 30 days of completion of the annual QA/QC plan review, certify in writing that the Owner will continue to implement the source's existing QA/QC plan or submit in writing any changes to the plan and the reasons for each change;</p> <p>g. Revision of the QA/QC plan is required if the results of emission report reviews, inspections, audits, review of the QA/QC plan, or any other information available to the division show that the plan does not meet the criteria specified in 40 CFR 60, Appendix F, Procedure 1, section 3; and</p> <p>h. The QA/QC plan shall be considered an update to the CEMS monitoring plan required by Env-A 808.04.</p>	

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station	Engineer:	G. Milbury
Location:	Bow, NH		
AFS #:	3301300026	Application #:	FY07-0103
		Date:	03/06/2009
			Page 8 of 16

Table 8 – Monitoring and Testing Requirements

Device	Parameter	Method of Compliance	Frequency of Method
MK1 & MK2	Mercury Emissions	<p><i>Monitoring of Mercury Emissions</i></p> <p>a. Prior to the availability and operation of CEMS, and subsequent to the baseline emissions testing under RSA 125-O:14, II, stack tests or another methodology approved by DES shall be conducted twice per year to determine mercury emissions levels from the affected sources.</p> <p>b. Any stack tests performed shall employ a federally recognized and approved methodology, proposed by the owner and employing a test protocol approved by DES.</p> <p>c. When a federal performance specification takes effect and a mercury CEMS capable of meeting the federal specifications becomes available, a mercury CEMS, approved by DES, shall be installed on STMK3 as deemed appropriate by DES.</p>	Twice per year or until a mercury CEM system is in operation and approved by DES
MK1 & MK2	Stack flow, NO _x , SO ₂ , and CO ₂ (or O ₂), opacity	The new stack (STMK3 from the FGD) serving units MK1 and MK2 shall be equipped with flow monitoring, NO _x , SO ₂ , and CO ₂ or O ₂ CEMs and a continuous opacity monitor (COMS) ¹⁰ . The CEMS and COMS shall meet 40 CFR 75 requirements.	Continuously
MK2-PC7	FGD Operating Parameters	<p>a. The Owner shall continuously monitor the scrubber liquor pH and FGD absorber exit gas temperature.</p> <p>b. The Owner shall calibrate or validate the accurate operation of the instruments measuring the parameters a minimum of once annually in accordance with manufacturer's recommended procedures or alternative procedures as approved by DES. All records of the calibrations or validations shall be kept and made available upon request.</p>	Continuously
MK2-PC7	FGD Data Acquisition System	The Owner shall have a data acquisition system for the FGD absorber exit gas temperature and scrubber liquor pH monitors, which calculates and monitors hourly averages and daily averages.	Continuously
MK1 & MK2	Sulfur Test Method for Coal	The owner or operator shall use Method ASTM D 4239-00 to determine the sulfur content of coal in pounds of sulfur per million BTU gross heat content.	Each shipment of coal

COMPLIANCE STATUS

Completed Emission Monitoring/Testing

The Facility uses their NO_x and SO₂ CEMS to determine compliance with the applicable NO_x and SO₂ emission limits for MK1 and MK2. PSNH also operates a CO₂ CEMS for diluent gas measurement to compute emissions in tons per hour. Table 9 below, lists the annual average emission rates in pounds per hour (lb/hr), for SO₂ and NO_x, and the annual tons per year (TPY), of SO₂, NO_x and CO₂ as measured by the CEMS for calendar year 2007.

¹⁰ Due to excessive moisture in the flue gas exiting the FGD system, the COMS will be installed prior to the stack.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station		Engineer:	G. Milbury		
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 9 of 16

Table 9 – 2007 Average Emission Rates and Annual Emissions as Measured by CEMS¹¹

Unit	SO ₂ (Annual Avg. lb/hr)	SO ₂ (TPY)	NO _x (Annual Avg. lb/hr)	NO _x (TPY)	CO ₂ (TPY)
MK1	2,675.9	11,420.0	227.4	970.5	1,115,208.9
MK2	6,704.2	25,064.0	601.3	2,248.0	2,611,007.3

Annual relative accuracy test audits (RATA) are conducted to ensure that the CEMS are within the required accuracy limits as specified in Env-A 800 and 40 CFR Part 75. Table 10 below contains the RATA conducted since July of 2006.

Table 10 – RATA Conducted on the NO_x, SO₂ & CO₂ CEMS at PSNH

Unit	Date	CEMS Systems	Results
MK1	8/18/08	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed
MK2	8/20/08	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed
MK1	9/18/07	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed
MK2	9/19/07	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed
MK1	7/18/06	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed
MK2	7/18/06	NO _x , SO ₂ , CO ₂ and Stack Flow	Passed

To verify compliance with the particulate matter and ammonia slip limits for MK1 and MK2, the Facility conducts periodic stack tests and also monitors the operating parameters of the air pollution control systems to ensure that the control systems are working as designed. The two combustion turbines (CT1 and CT2) do not have CEMS. CT1 and CT2 are required to perform stack testing for NO_x every three years to verify compliance with the NO_x RACT limit for combustion turbines. In accordance with RSA 125-O:14 and O:15, PSNH has conducted several stack tests on both MK1 and MK2 for the establishment of baseline mercury emissions and periodic monitoring of mercury emissions. Table 11 below, contains a summary of the stack test discussed above.

¹¹ Data has been corrected to be consistent with the application and the information contained in the federal Acid Rain Program inventory.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station	Engineer:	G. Milbury
Location:	Bow, NH		
AFS #:	3301300026	Application #:	FY07-0103
Date:	03/06/2009	Page 10 of 16	

Table 11 – Summary of Previous Compliance Stack Tests

Emission Unit	Test Date	Pollutant	Test Result	Emission Limit	Pass/Fail
MKCT1	4/12/07	NOx	0.840 lb/MMBtu	0.90	PASS
MKCT2	4/16/07	NOx	0.743 lb/MMBtu	0.90	PASS
MK1	6/14/00	TSP	0.083 lb/MMBtu	0.268	PASS
MK2	3/14/00 and 3/15/00	TSP	0.021 lb/MMBtu	0.227	PASS
MK1	6/14/00	Ammonia Slip	0.06 ppm @ 3% O2	10 ppm @ 3% O2	PASS
MK2	6/13/00	Ammonia Slip	0.18 ppm @ 3% O2	10 ppm @ 3% O2	PASS
MK1	1/20/07	Mercury	0.0000149 lb/MMBtu	No current limit – testing to determine baseline mercury emissions as required by RSA 125-O:14 and periodic mercury monitoring in accordance with RSA 125-O:15	Not Applicable
	2/6/07	Mercury	0.00000842 lb/MMBtu		
	2/22/07	Mercury	0.00001038 lb/MMBtu		
	4/11/07	Mercury	0.00000533 lb/MMBtu		
	5/31/07	Mercury	0.00000516 lb/MMBtu		
	3/14/08	Mercury	0.00000448 lb/MMBtu		
	8/7/08	Mercury	0.00000448 lb/MMBtu		
MK2	1/31/07	Mercury	0.00001124 lb/MMBtu	No current limit – testing to determine baseline mercury emissions as required by RSA 125-O:14 and periodic mercury monitoring in accordance with RSA 125-O:15	Not Applicable
	2/21/07	Mercury	0.00000981 lb/MMBtu		
	4/10/07	Mercury	0.00000876 lb/MMBtu		
	6/4/07	Mercury	0.00000751 lb/MMBtu		
	6/5/07	Mercury	0.00000778 lb/MMBtu		
	3/12/08	Mercury	0.00000628 lb/MMBtu		
	8/8/08	Mercury	0.00000602 lb/MMBtu		

Inspections

DES last conducted an on-site full compliance evaluation (inspection) on September 14, 2005. The Facility was determined to be in compliance at that time. DES also conducted an off-site compliance evaluation on January 15, 2003, which primarily involved the review of all reports submitted to DES since the previous inspection. No compliance issues were found during that review. DES also conducted four partial or full compliance inspections since September 2001 and no compliance issues were found during those inspections.

Reports

The current air permits for this Facility require the submittal of several reports, including quarterly emission reports, quarterly excess emission reports, quarterly reports regarding fuel quality, and an annual compliance certification. The Facility is up to date on reporting.

Fees

The Facility has paid their emission based fees as required by Env-A 700.

PERMIT APPLICATION REVIEW SUMMARY						
Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 11 of 16

Application Fees

As this application is for an existing Title V Facility that pays emission based fees, an application review fee is not required for this project. However, the source is required to pay testing and monitoring fees to cover the cost of DES personnel that will witness the emission tests required under this permit. The Facility is required to pay the testing and monitoring fees within 60 days after DES submits the bill to the applicant.

REVIEW OF REGULATIONS

Applicable Federal and State Laws and Regulations for this Temporary Permit

- RSA 125-C – Air Pollution Control
- RSA 125-O – Multiple Pollutant Reduction Program
- 40 CFR 60.8 Performance Tests
- 40 CFR 75 – Continuous Emission Monitoring
- 40 CFR 51 Subpart P – Protection of Visibility
- Env-A 600 Statewide Permit System
- Env-A 700 Permit Fee System
- Env-A 800 Testing and Monitoring Procedures
- Env-A 900 Owner or Operator Recordkeeping and Reporting Obligations
- Env-A 1002 Fugitive Dust
- Env-A 1400 Regulated Toxic Air Pollutants

Modeling Summary Document Below

PERMIT APPLICATION REVIEW SUMMARY						
Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 12 of 16

STATE OF NEW HAMPSHIRE
Department of Environmental Services
Air Resources Division

Intraoffice Memorandum

TO: Gary Milbury, Program Manager
Permitting and Environmental Health Bureau

DATE: December 11, 2008

FROM: Jim Black, Dispersion Modeler
Permitting and Environmental Health Bureau

AFS #: 3301300026
Application #: FY07-0103

SUBJ: PSNH Merrimack Station – 97 River Road, Bow
Modeling for Proposed FGD System

UTM E: 299333
UTM N: 4779440

Modeling Project Summary

- **Purpose:** proposed wet Flue Gas Desulfurization (FGD) system
- **Initial assumptions (modeling input):** 8760 hrs/yr
- **Pass/Fail (if failed for what):** passed for all pollutants
- **Restrictions resulting from modeling (if failed):** none needed

DES has reviewed an ambient air quality impact analysis for the PSNH Merrimack Station electric generating facility in Bow. The analysis, as performed by TRC, was done in support of a permit application for a proposed wet Flue Gas Desulfurization (FGD) system, which will result in reductions of sulfur dioxide and mercury emissions. The facility currently operates two coal-fired steam generating units (MK1 and MK2), two combustion turbines (CT1 and CT2) which are used for load shaving and an emergency boiler (EB). Each unit was modeled by TRC using a number of possible operating scenarios to reflect potential future conditions. The facility also operates an emergency generator, two coal crushers and a number of other devices which are not required to be modeled for this application.

The future operating conditions reflect the addition of the FGD system and include scenarios to address a normal operating case as well as four alternative cases which are possible during maintenance of the steam generating units and/or the FGD system. The possible operating scenarios are listed below:

1. MK1 and MK2 exhausting through the FGD stack (normal operating case)
2. MK1 exhausting through the FGD stack, with MK2 not operating
3. MK1 exhausting through the MK2 stack, with MK2 not operating
4. MK2 exhausting through the FGD stack, with MK1 not operating
5. MK1 exhausting through the MK2 stack and MK2 exhausting through the FGD stack

The FGD stack will need to be constructed as part of the desulfurization project while the existing MK1 and MK2 stacks will remain in place (though the MK1 stack will no longer be used once the FGD system is operational). Additional structures will also be added to support the FGD project. The stack and emissions data for all scenarios

PERMIT APPLICATION REVIEW SUMMARY						
Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 13 of 16

are given in Table 1.

Table 1
Modeled Emission Rates and Stack Parameters for all Proposed Operating Scenarios
(based on maximum load conditions)

Parameter	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5*
SO ₂ Emission Rate (lb/hr)	2538.9	684.1	6835.8	1854.8	8690.6
PM10 Emission Rate (lb/hr)	1123.8	334.1	334.1	789.7	1123.8
NO _x Emission Rate (lb/hr)**	2425.5	1508.0	1508.0	1283.6	2791.6
CO Emission Rate (lb/hr)	92.1	24.6	24.6	68.3	92.9
Ammonia Emission Rate (lb/hr)	30.2	9.5	9.5	20.6	30.1
Stack Height (ft)	445	445	317	445	317 / 445
Exit Diameter (ft)	21.5	21.5	14.5	21.5	14.5 / 21.5
Flow Rate (ACFM)	1304420	379831	475647	924589	475647 / 924589
Exhaust Temp (°F)	130	127	343	131	343 / 131
Stack Orientation	vert./unobs.	vert./unobs.	vert./unobs.	vert./unobs.	vert./unobs.
Scenario Explanation	MK1 and MK2 through FGD	MK1 through FGD	MK1 through MK2 stack	MK2 through FGD	MK1 thru MK2 MK2 thru FGD

* emission rates for Scenario 5 are combined from two stacks

** NO_x emission rates were reduced 25% in the modeling analysis from the amounts shown in Table 1 to account for the conversion to NO₂

TRC used AERMOD to perform the modeling analysis, as was proposed in their *Air Quality Modeling Protocol*, dated February, 2008. The use of this model was approved by both DES and EPA for this project. In addition to the model selection, the protocol described the building data and GEP analysis, the meteorological data and processing, the receptors to be modeled and other details. DES commented on the protocol on March 21 of this year and provided additional comments to PSNH on July 23. PSNH responded to all comments to DES' satisfaction and transmitted the *Air Quality Modeling Report*, with accompanying data files, on November 21, 2008. It should be noted that PSNH collected on-site meteorological data from January, 1994 up to November, 1995. These data were processed by TRC and used in the modeling analysis.

In addition to the five operating scenarios, TRC looked at load conditions for the MK1 and MK2 units since these devices have the potential to operate at less than full capacity. Criteria pollutants from fuel combustion were evaluated as well as ammonia resulting from operation of the SCR deNO_x system (used to control nitrogen oxides emissions). The impacts of the criteria pollutants were evaluated against the NAAQS while ammonia impacts were compared to the New Hampshire Ambient Air Limits (AALs). PSNH performed a comparison of past baseline versus future projected emissions and determined that, due to emissions decreases, there would not be any increment consumption so those air quality standards are not required to be addressed as per federal regulations.

PERMIT APPLICATION REVIEW SUMMARY						
Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 14 of 16

The PSNH property is bordered by the Merrimack River to the east, a fence from the river northward and westward to the storage piles and by a creek and wetlands north of the piles back to the river. Receptors were placed along these boundaries at 20m intervals. PSNH has stated that the property line is posted and patrolled and is therefore inaccessible to the public. For this reason, impacts from the facility were only calculated beyond the PSNH property boundary.

The maximum predicted impacts from the five operating scenarios outlined above are shown in Table 2. The highest impacts are a result of the alternative case where the MK1 unit exhausts through the MK2 stack and MK2 exhausts through the new FGD stack (Scenario 5). For the short-term averages (24-hours and less) the maximum impacts are dominated by the emergency boiler which, though its emissions are much less than the primary power units, has a very short stack, resulting in significant plume downwash. The maximum impacts from this device are within 1330 feet from the stack for all pollutants and averaging periods, illustrating the localized nature of the impacts under this scenario.

The maximum impacts from the normal operating case where MK1 and MK2 exhaust through the new FGD stack (Scenario 1) are shown in Table 3. These impacts are seen to be significantly less than the alternative case impacts given in Table 2. The high impact locations extend out as far as nearly six miles, which is a result of the 445 foot stack (constructed to GEP height to minimize downwash). The impacts from this operating scenario, as well as for all alternative cases, are predicted to be below the NAAQS. For all cases, the PSNH devices, with the exception of the emergency boiler, were assumed to operate 8760 hours per year.

In order to demonstrate compliance with air quality standards throughout the region, PSNH was required to model the impacts from interactive sources. Based on the impact areas calculated by TRC, DES determined that 46 additional sources (comprising 106 individual devices) would be needed in the final modeling analysis to insure that PSNH does not cause or contribute to an overall air quality violation. These sources were modeled in addition to the PSNH devices (for all operating scenarios) and the maximum impacts are presented in Table 4. The maximum overall impacts are dominated by the PSNH emergency boiler but are well below the NAAQS.

As mentioned earlier, ammonia is emitted by the PSNH facility as a result of the operation of NOx control equipment. The emissions were estimated based on an assumed 20 ppm ammonia slip rate and the maximum impacts were compared to the AALs. The results of this analysis are shown in Table 5 and demonstrate that the highest predicted ammonia impacts are well below the New Hampshire limits.

In summary, DES has reviewed the modeling analysis prepared by TRC for the PSNH FGD project and has determined that the maximum predicted impacts from all proposed operating scenarios are below federal and state air quality standards and limits.

PERMIT APPLICATION REVIEW SUMMARY

Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 15 of 16

Table 2
Maximum Impact Scenario from PSNH MK1 and MK2 Sources Only (ug/m³)
 (Scenario 5: MK1 exhausting through the MK2 stack
 and MK2 exhausting through the FGD stack)

Pollutant	Avg Time	Contrib	Bckg*	Impact	NAAQS	Pass/Fail
SO₂	Annual	20.0	8	28.0	80	PASS
	24-Hour	174.3	42	216.3	365	PASS
	3-Hour	474.5	152	626.5	1300	PASS
PM₁₀	Annual	2.1	20	22.1	50	PASS
	24-Hour	17.3	38	55.3	150	PASS
NO₂ **	Annual	4.3	22	26.3	100	PASS
CO	8-Hour	29.0	--	29.0	10000	PASS
	1-Hour	74.4	--	74.4	40000	PASS

* background data from Manchester, except SO₂ from Concord

** NO₂ impacts include 75% conversion rate of NO_x to NO₂

Table 3
Maximum Impacts from Normal Operating Case Only (ug/m³)
 (Scenario 1: only MK1 and MK2 operating and exhausting through the FGD stack)

Pollutant	Avg Time	Contrib	Bckg*	Impact	NAAQS	Pass/Fail
SO₂	Annual	2.8	8	10.8	80	PASS
	24-Hour	28.2	42	70.2	365	PASS
	3-Hour	78.4	152	230.4	1300	PASS
PM₁₀	Annual	1.2	20	21.2	50	PASS
	24-Hour	12.5	38	50.5	150	PASS
NO₂	Annual	2.0	22	24.0	100	PASS
CO	8-Hour	2.5	--	2.5	10000	PASS
	1-Hour	7.0	--	7.0	40000	PASS

PERMIT APPLICATION REVIEW SUMMARY						
Facility:	Public Service of New Hampshire, Merrimack Station			Engineer:	G. Milbury	
Location:	Bow, NH					
AFS #:	3301300026	Application #:	FY07-0103	Date:	03/06/2009	Page 16 of 16

Table 4
Maximum Impacts from All Modeled Sources - PSNH Plus Interactives (ug/m³)
 (assuming worst-case PSNH operating scenario – Scenario 5)

Pollutant	Avg Time	Contrib	Bckg*	Impact	NAAQS	Pass/Fail
SO ₂	Annual	22.3	8	30.3	80	PASS
	24-Hour	178.1	42	220.1	365	PASS
	3-Hour	482.4	152	634.4	1300	PASS
PM ₁₀	Annual	2.4	20	22.4	50	PASS
	24-Hour	17.7	38	55.7	150	PASS
NO ₂	Annual	8.2	22	30.2	100	PASS
CO	8-Hour	29.0	--	29.0	10000	PASS
	1-Hour	74.4	--	74.4	40000	PASS

Table 5
Maximum Ammonia Impacts from PSNH Devices (ug/m³)
 (Scenario 5: MK1 exhausting through the MK2 stack
 and MK2 exhausting through the FGD stack)

Pollutant	24-Hour Impact	24-Hour AAL	Annual Impact	Annual AAL	Pass/Fail
Ammonia	0.59	100	0.06	100	PASS

Project Tracking and Details

- **Modeler(s):** J. Black
 - **Site visit made on:**
 - **Hardcopy files returned to:**
 - **Model:** AERMOD v. 07026, AERMET v. 06341
 - **Met data:** 1994 – 1995
 - **Analysis details:** all results are based on DES confirmation runs of the TRC modeling
- Reviewers:** L. Landry/
D. Healy
- Met site:** on-site